Conservation Perils from Marijuana Cultivation on Public Lands in California

Mourad W. Gabriel, MS, PhD.
Executive Director
www.IERCecology.org
Integral Ecology Research Center

Collaborative Efforts

- Interdisciplinary approach
- Working with Federal, State, Academia and NGOs "Out of the Box" approach.

What does Marijuana Cultivation look like on Public Lands?

What does Marijuana Cultivation look like on Public Lands?

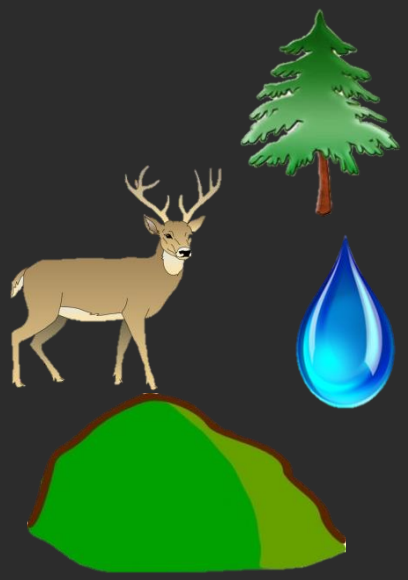
Trinity Alps Wilderness

Marijuana Cultivation: A Threat to Conservation?

Common Assumptions

- "Mom and Pop" grows
- Organically grown
- "It's just a plant"

Like any activity, if reducing production costs can be exploited, many will take advantage of this quickly and as furiously as possible, before that opportunity is gone.



Free!

Low Risk!

Hardin's (1968): *Tragedy of the Commons*

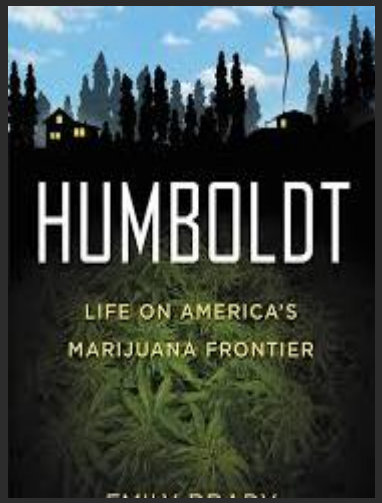
"individuals that act independently in their own self-interest, will ultimately deplete a shared limited resource even when it is clear that it is not in anyone's long-term interest for this to happen."

"benefits and costs for utilizing these shared resources are not equally distributed"

Why California?

California: Template for Initiating Scientific Solutions

- 60-70% of the nation's marijuana cultivation
- Large amounts of public and tribal lands (55-60% of CA production)
- 2nd largest number of ESA listed species (320 species)
- Cultivation conflicts with numerous groups



Natural Resource Exploitation

Water

Diversions

Forest

Fragmentation

Wildlife

Contamination

Water

Public Land Water Diversion Rates

=

6-8 gallons a day

=

150 days

900 - 1,200 gallons per plant/season

Public Land Water Diversion Rates: California

*** 1,200 gallons per plant, full season**

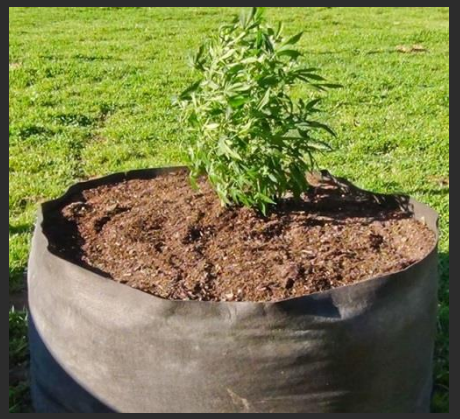
2012: ~870,000 plants = **1.04 billion gallons**

2013: ~500,000 plants = **600 million gallons**

2014: +500,000 plants = **600 million gallons**

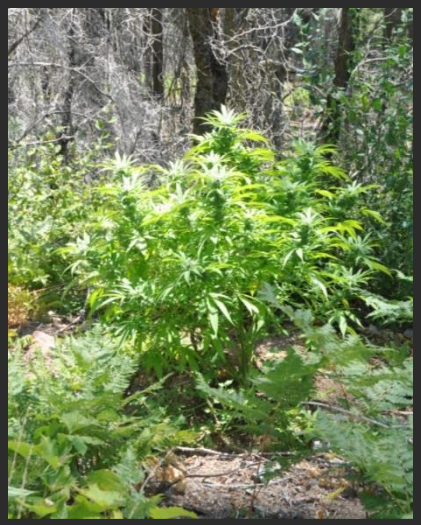
Each Year: Amount of San Francisco households uses: **3 weeks to +1 month**

6-8 gallons a day, per plant



Is 6-8 gallons a day realistic?

- **Evapotranspiration**
  - Native porous soils
  - Evaporation from soil surface
  - Evaporation from plant leaves (transpiration)
- **Climate**
- solar radiation, temperature, humidity, wind
- **Plant**
- Stage of growth, health of the plant

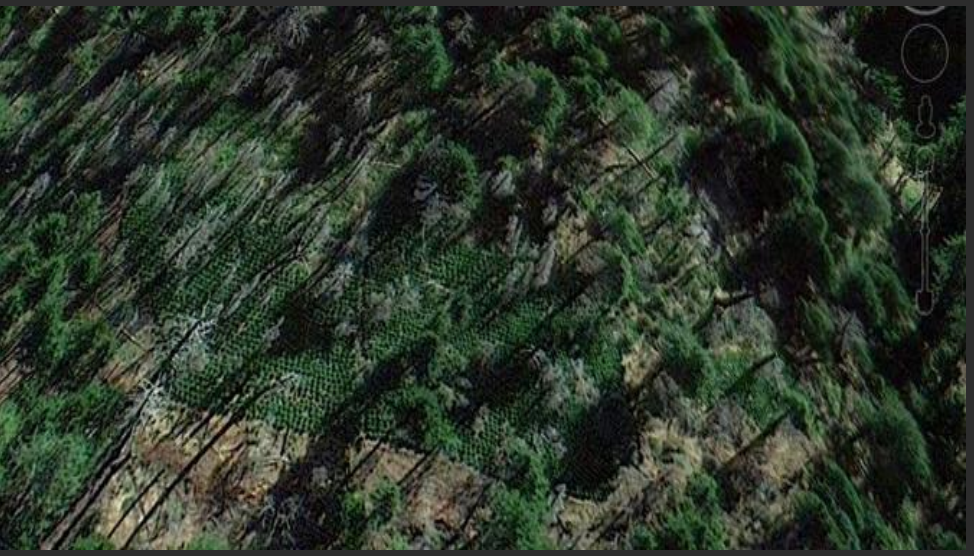


Impacts to Aquatic Organisms from Water Diversions

- Loss of habitat
- Higher water temperatures
- Increase susceptibility to diseases
- Decrease prey availability for aquatic and terrestrial wildlife

Forest Fragmentation

Facilitate increased erosion & sedimentation rates



Removal of habitat for species of conservation concern

Critical Habitat or Wildlife Lost from Grow Site Initiated Fires

2006-2014

- **Confirmed <u>110,235 acres</u>**

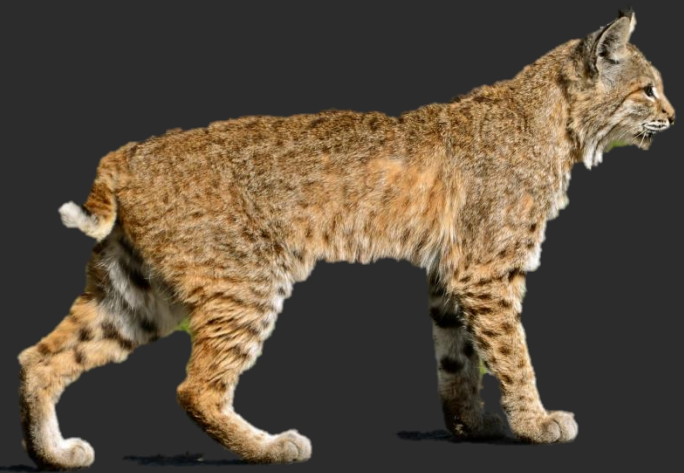
Total cost <u>> $55 Million</u>

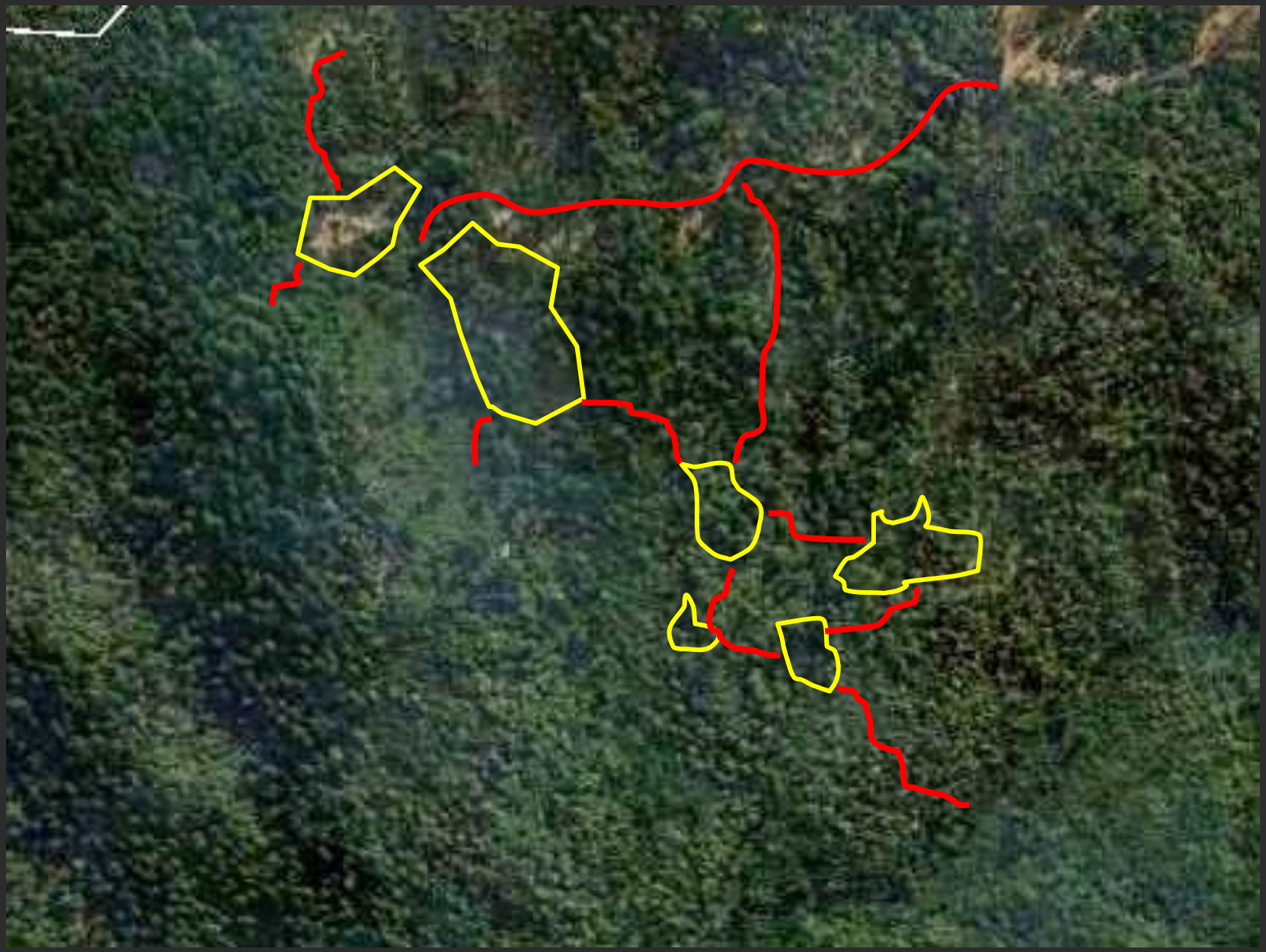
Suppression Cost <u>Only</u>

Can these grow sites facilitate an increased risk to conservation concerned species?

- Predation on fisher, American marten, Humboldt marten
  - Predation #1 mortality factor; **≥70%** of all mortality
  - Bobcat is the #1 predator

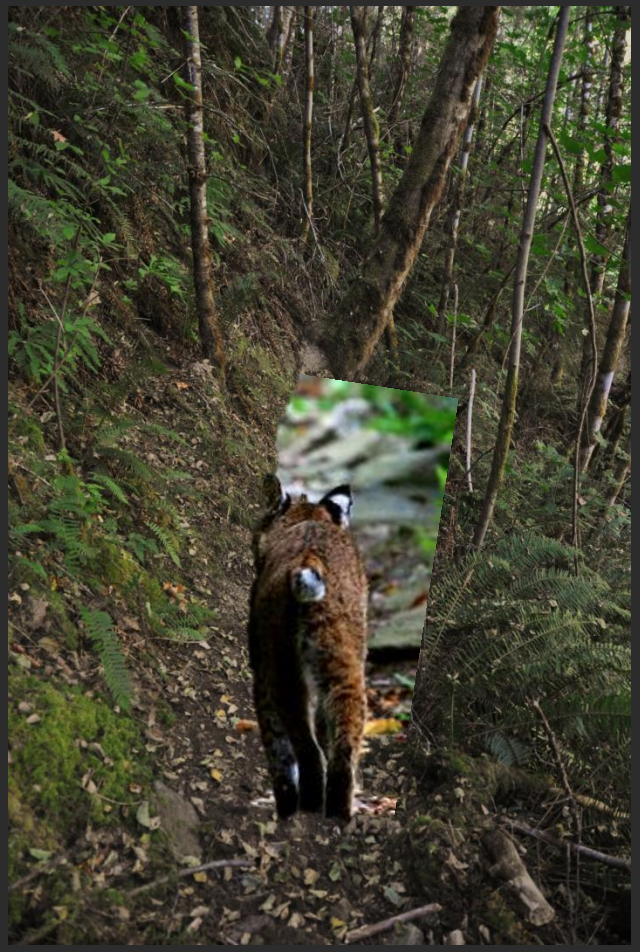
Why such a high rate of predation?

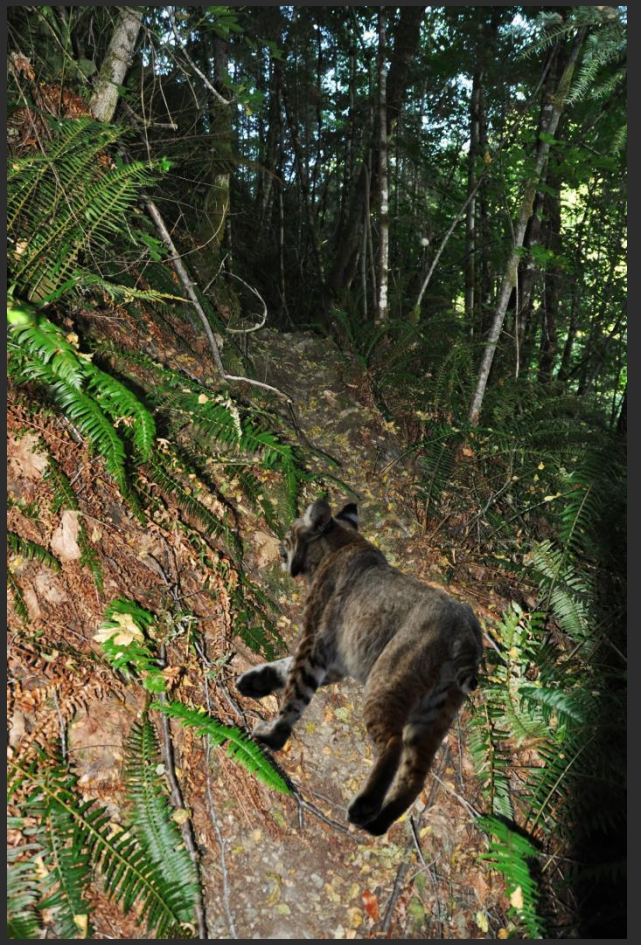




Trail System

Could these trails heighten predator movement within and between these sites?





Wildlife Contamination

Fisher (*Martes pennanti*): Forest specialist mid-sized carnivore

USFWS: **Proposed for listing under the Endangered Species Act**

PLOS ONE

Anticoagulant Rodenticides on our Public and Community Lands: Spatial Distribution of Exposure and Poisoning of a Rare Forest Carnivore

PLoS ONE Paper (2008-mid-2012)

- **79%** CA fishers exposed
- **4** mortalities

Post-PLoS (mid 2012 - 2014)

- **86%** CA fishers exposed
- **9** new mortalities
- Total of **13** fisher deaths

57% Increase of Cases

Conservation Letters
A journal of the Society for Conservation Biology

Impacts of rodenticide and insecticide toxicants from marijuana cultivation sites on fisher survival rates in the Sierra National Forest, California

- AR Exposed Females: 4 sites vs. non-exposed: 0.67 sites

Conservation Letters
A journal of the Society for Conservation Biology

Impacts of rodenticide and insecticide toxicants from marijuana cultivation sites on fisher survival rates in the Sierra National Forest, California

- AR Exposed ♀ highest: 16 sites vs. non-exposed: 1 sites

Supply Creek Trespass Marijuana Garden:

Trail cameras at garbage and toxicant dump areas

Hoopa Tribe

Integral Ecology Research Center

IERCecology.org

July 2013: “Hot Dog” Fisher

- Small Grow, < 400 plants
- Case of poisoning with “Restricted Use” pesticide.
  - Hot dog laced with carbamate insecticide.
  - Found dead less than 20m from small grow site.

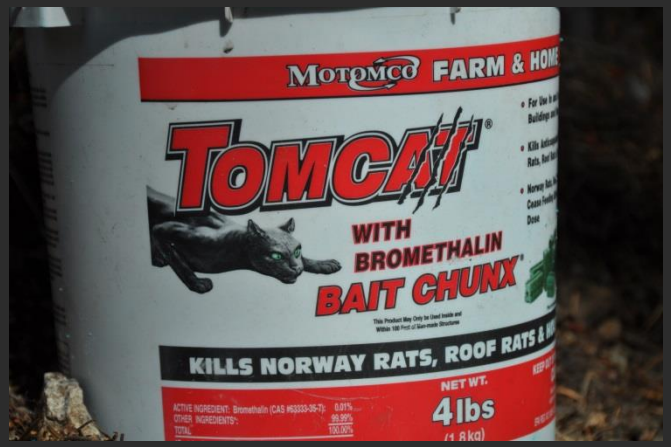
Will the Recent Anticoagulant Restrictions Help?

Replacement rodenticides taking their place

BROMETHALIN (Neurotoxicant)

- Flavorized
- No Antidote
- Very difficult to interpret (pathology)

Recent Grow (2014) had 24 pounds of Bromethalin



Hoopa Tribe
Fisher Demographic Study

Short video of a suspected toxicosis case in a fisher (*Martes pennanti*)

Integral Ecology Research Center

WILDLIFE CONSERVATION SOCIETY

UCDAVIS
UNIVERSITY OF CALIFORNIA

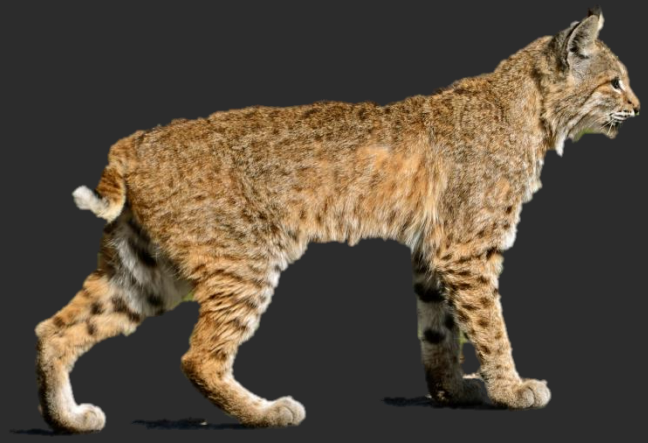
Could prey abundance decline due to pesticides?

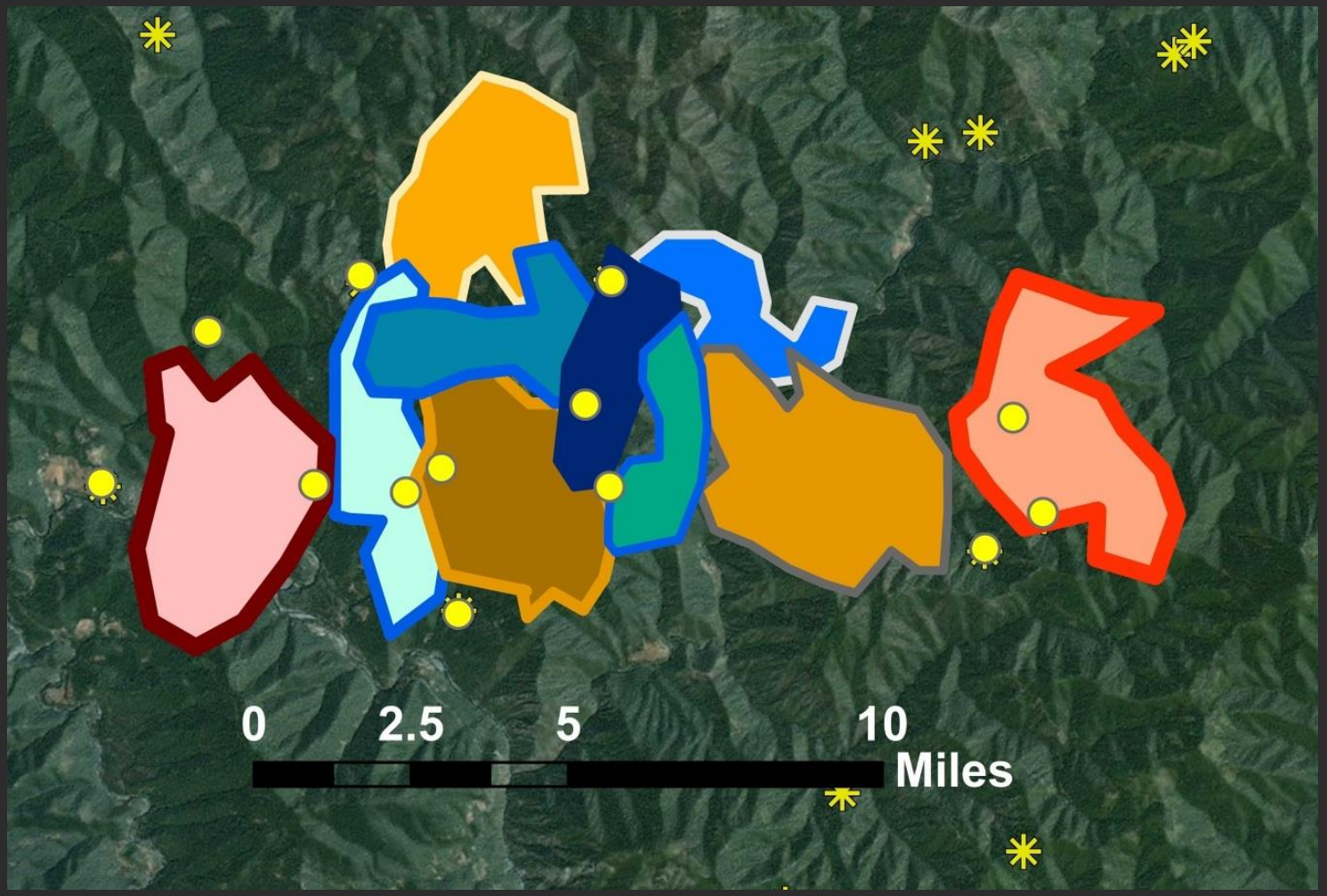
&

Could this be affecting wildlife species indirectly?

Response of carnivores that depend on this prey can take many forms.

- Expand home range to encompass more prey opportunities, increased movement, encounter more predators.

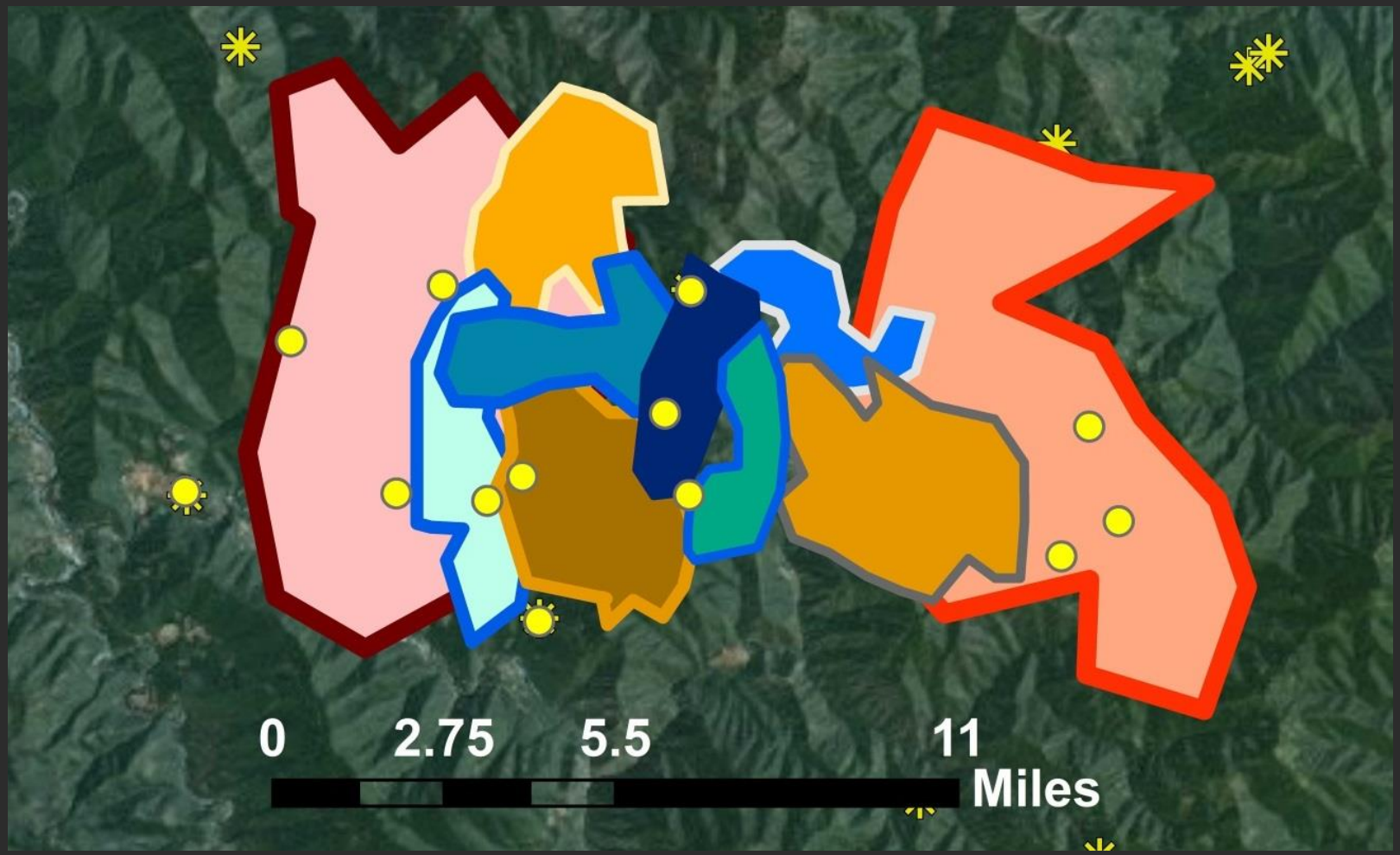




Male Fisher Home Range

Female Fisher Home Range

Bobcat Home Range

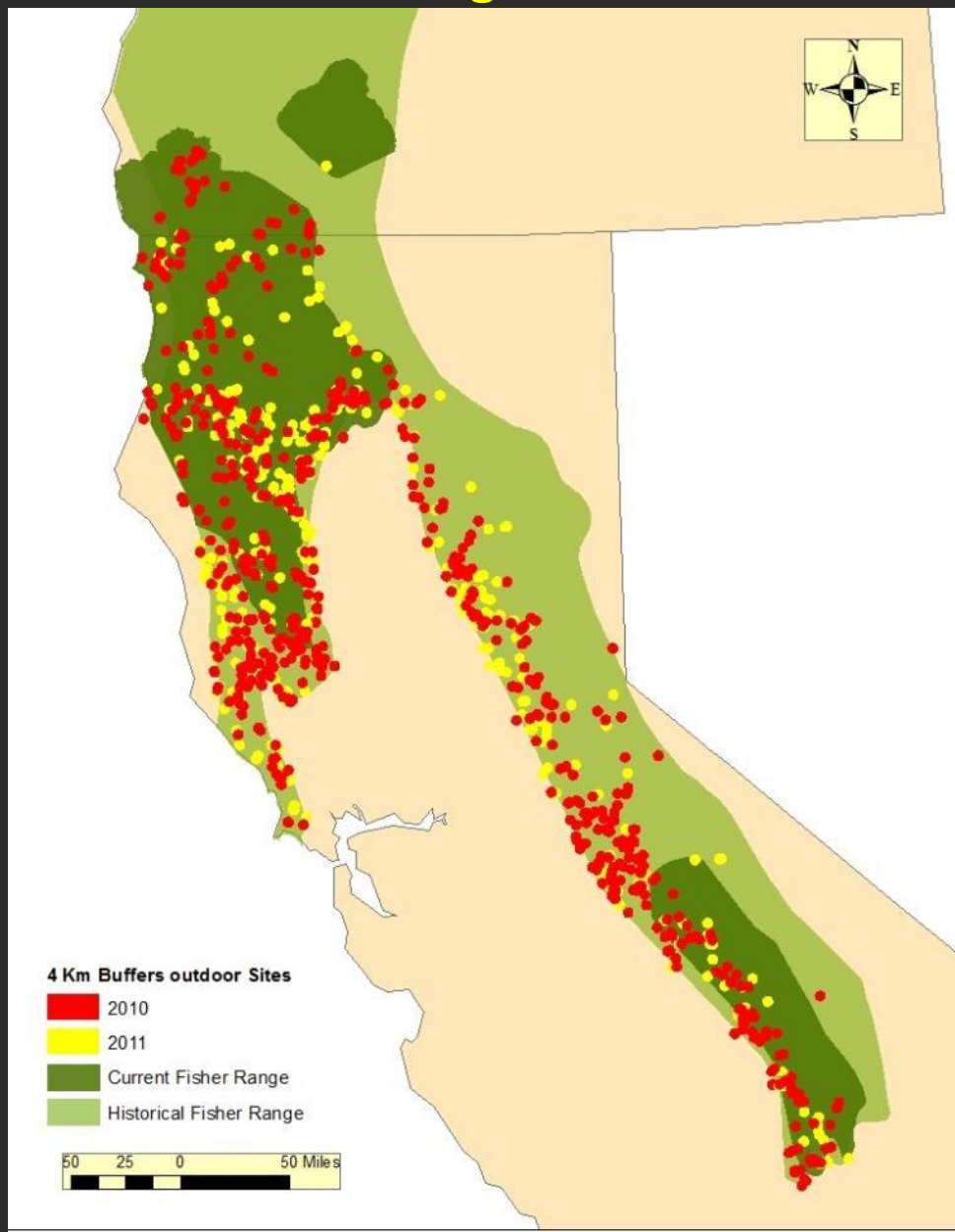


- Past studies; prey ↓ bobcat ↑ home range, 200-500%
- 200% ↑ lead to increased interaction probability w/ bobcats?

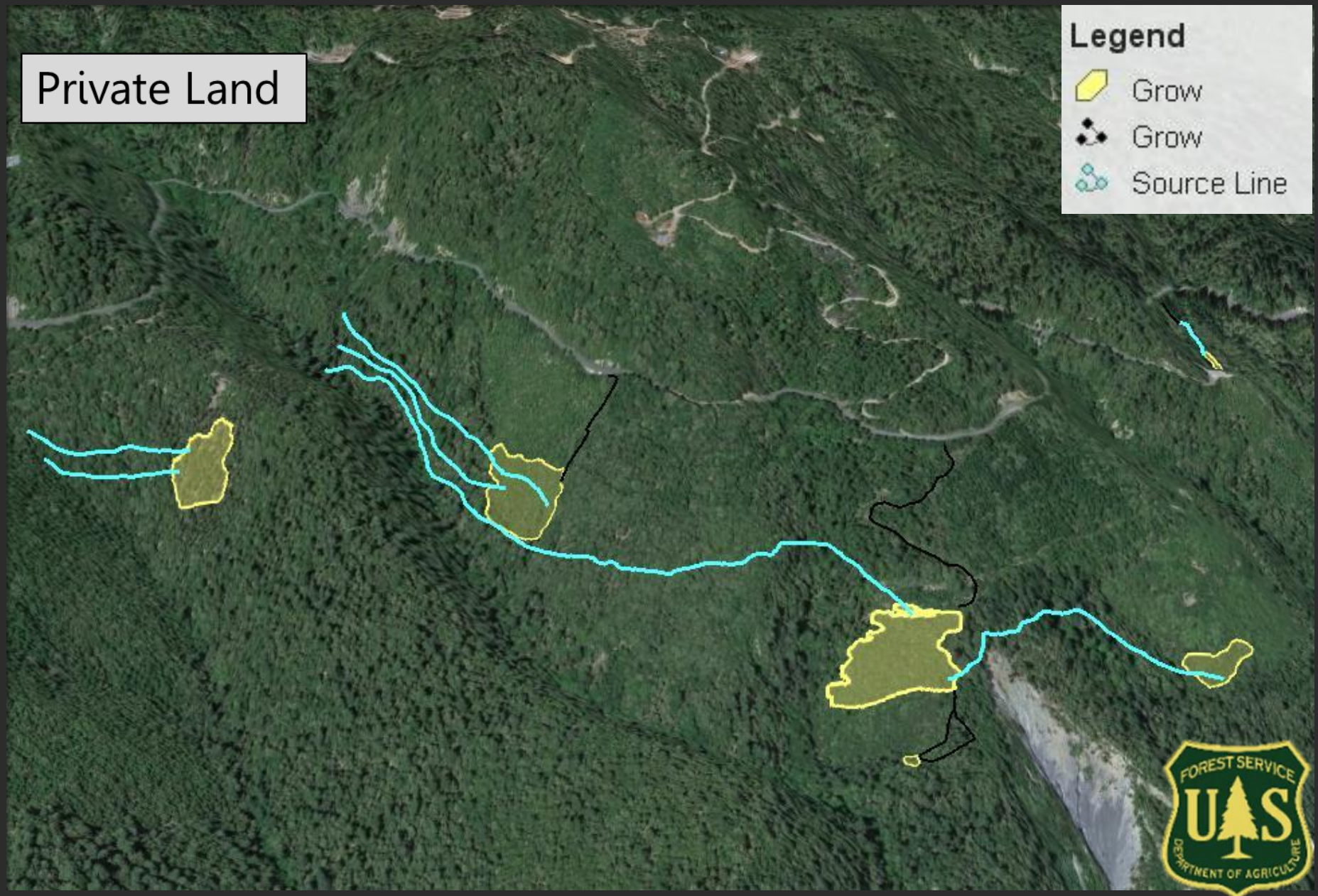
2010 -2011

- **~1,100** trespass grow sites eradicated
- Liberally, **only 40-60%** sites are discovered.
- Only a fraction are cleaned.
- Sites have the potential to impact **30-35%** of fisher's current range.

Trespass Marijuana Sites within the Fisher's Range




Private Land
FOREST SERVICE
US
DEPARTMENT OF AGRICULTURE


Private Land
Legend
Grow
Grow
Source Line
FOREST SERVICE
US
DEPARTMENT OF AGRICULTURE

Barred Owls: **Proxy for the Northern Spotted Owl**

- GDRC 34 of 84 **(40%)** owls were positive
- Hoopa 44 of 71 **(62%)** owls were positive

- All positive owls were exposed to 2nd Gen ARs

Invertebrates: Is the food web contaminated?

- A total of 13 invertebrates were pooled into four (4) samples.
  - All four (**100%**) pools were positive for ARs.

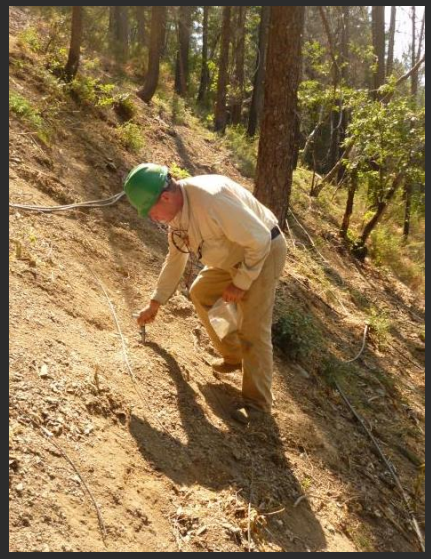
- Yellow-spotted millipede (*Harpaphe haydeniana*):
- Pacific sideband snail (*Monadenia fidelis)*
- Grasshopper (suborder Caelifera)
- Ground beetles (family Carabidae)

How contaminated are these sites?

Soil Testing: Pesticides (OP, Carbamates and ARs)

- Submitted 2 out of 7 grow site samples
  - One grow site negative
  - One grow site positive for Difethialone (2nd gen AR)
    - DIF was not discovered at the site the year sampled

- Soil Ecology: Diazotroph ecology
  - N fixing bacteria



Game Species Contamination

Can game species humans consume be exposed to these toxicants?

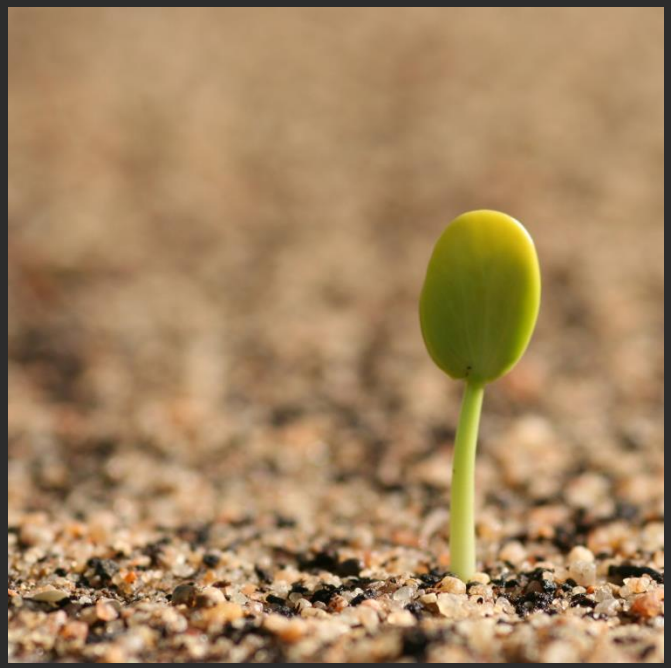
- Yes

Can humans who consume their meat be exposed?

- Investigation ongoing
  - US Forest Service and Mule Deer Foundation

This issue is not new but the research is in its infancy.

A lot of data has been generated in the past 3 years!



Removing These Threats to Wildlife

October 2014, Number of trespass sites cleaned: 7

Personnel per day: 50 (25 Officers & N. Guard; 25 Sci. Team & Volunteers)

Total water diversion restored to watersheds: 67.5 million gallons

Total amount of fertilizer used at sites: 8,188 pounds

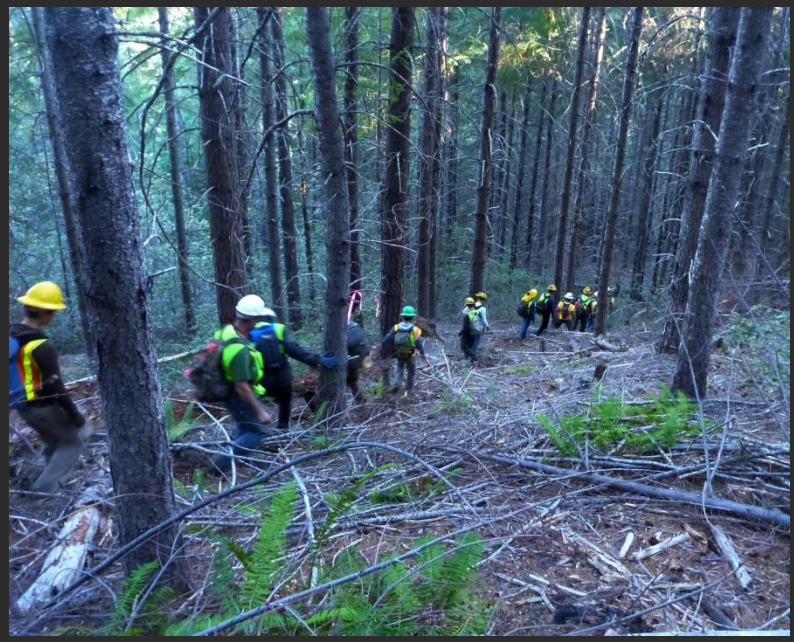
Total amount of rodenticide used at sites: 128 pounds

Insecticide used at sites: 560 gallons of usable insecticide

Carbofuran used at sites: 68 ounces concentrated carbofuran

Garbage removed: >8,000 pounds

Irrigation pipe removed: >8.5 miles



Barriers and Solutions

Support for more Science-based Information

- Inform agencies, managers and policy-makers.
- Educate the public on this issue.

Safety

- Scientists and Law Enforcement

Create Mechanisms of Support

- Support to document, test and analyze samples
- Remediation to remove these threats

Thank You

Contact info: Dr. Mourad W. Gabriel

Email: mgabriel@IERCecology.org

www.IERCecology.org

Integral Ecology Research Center